CAFOs Uncovered

The Untold Costs of Confined Animal Feeding Operations

Doug Gurian-Sherman

UNION OF CONCERNED SCIENTISTS
APRIL 2008

CONTENTS

Figures and Tables		iv
Acknowledgments		v
Executive Summary		1
	CAFOs: Too Big for Our Own Good	2
	Better Options Exist	2
	The Many Hidden Costs of CAFOs	3
	Conclusions and Recommendations	5
Introduction		9
	The Rise of the CAFO	9
	Considering the Alternatives	10
Chapter 1.	**Production Costs of CAFOs and Alternative Systems**	13
	Problems Associated with CAFOs	13
	CAFOs Are Getting Bigger	14
	Bigger Does Not Mean More Efficient	16
	Factors Contributing to CAFO Growth	17
	Are CAFO Alternatives Cost-effective?	23
	Looking Beyond Narrowly Defined Costs	25
	Conclusions	26
Chapter 2.	**Direct and Indirect Subsidies to CAFOs**	29
	How Crop Subsidies Have Propped Up CAFOs	29
	Indirect Subsidies to Poultry CAFOs	31
	Indirect Subsidies to Hog CAFOs	31
	Indirect Subsidies to Beef and Dairy CAFOs	32
	Indirect Subsidies across Sectors	33
	Subsidies for Alternative Production Methods	33
	The Effect of Changing Grain Prices	35
	Summary of Indirect Subsidies to CAFOs	37
	Direct Subsidies to CAFOs	37
	Summary of Direct CAFO Subsidies under EQIP	40
Chapter 3.	**Externalized Costs of CAFOs**	41
	Pollution Caused by CAFO Manure	42
	Box: Regulation of CAFO Manure	53
	The Costs of Manure Disposal	56
	Other Externalized Costs	59
	Summary of CAFO Externalities	65
Chapter 4.	**Conclusions and Recommendations**	67
	Can Technology Fix CAFOs?	67
	Wanted: Sound Agricultural Policy	68
References		71
Glossary		83

provide cost estimates for certain aspects of these externalities, which are useful in providing a general sense of the extent of the subsidy represented by externalized costs. Other important topics such as water and energy use we leave for future evaluations.

Pollution Caused by CAFO Manure

Manure from CAFOs is a major source of water pollution because these operations produce too much manure in too small an area, and this manure is rarely treated to eliminate potentially harmful components before being applied to crop fields or stored in facilities such as lagoons or pits (EPA 2003). By comparison, the majority of human waste is processed by municipal wastewater facilities or septic systems before it can re-enter our water. The manure produced by individual CAFOs exceeds that produced by smaller AFOs or alternative animal farming operations, and as we will discuss, is also more likely to harm the environment and public health than that produced on other types of farms.

Most CAFOs collect and store manure prior to its application on farmland or fields. The most common storage structures for manure from dairy cattle and hogs are either lagoons or pits; poultry manure, because it has lower water content than cattle or hog manure, can be gathered into piles. Poultry manure is also often mixed with material such as wood chips that are spread on the floor of broiler facilities several times a year. The resulting combination of poultry manure, wood chips, wasted feed, and bedding material is referred to as litter. Poultry manure that has higher water content is stored in lagoons. Manure pits and lagoons may leak below the soil surface and contaminate groundwater, which may infiltrate wells that supply potable water (Volland, Zupancic, and Chappelle 2003; Huffman and Westerman 1995).

Most of the nitrogen in manure begins in either a complex organic form or as ammonia. Much of the ammonia is converted in aerobic environments, as on crop fields, into nitrate. Nitrogen in the form of nitrate is highly mobile in soils and is the constituent of manure most likely to have an adverse effect in drinking water. Concentrations of 10 mg/l of nitrate in drinking water may cause methemoglobinemia, or "blue baby syndrome," which may cause mortality (Fan and Steinberg 1996; Johnson and Koss 1990). Nitrate consumption has also been linked to certain cancers.

Groundwater pollution

Studies by the Kansas Geological Survey found that contamination in 42 percent of tested wells derived from animal waste (cited in Volland, Zupancic, and Chappelle 2003). U.S. Geological Survey (USGS) testing determined that animal waste was responsible for contamination of wells at 9 of 35 swine feeding operations in Oklahoma where nitrate levels exceeded the EPA safe drinking water limit of 10 mg/l (Becker, Peter, and Masoner 2002). In North Carolina, groundwater near 11 swine lagoons had an average nitrogen concentration of 143 mg/l (Huffman and Westerman 1995). Groundwater may move laterally and eventually enter surface water sources such as rivers, and may thereby contribute to eutrophication (the potentially harmful proliferation of plant life in nutrient-rich water) or other problems. Symptoms of eutrophication include nuisance or toxic algal blooms, low levels of dissolved oxygen (which can cause fish die-offs), aquatic food web disruptions, and taste, odor, or aesthetic problems in water resources.

Movement of leaked nitrogen from CAFO manure lagoons may continue to be a threat to groundwater even after a CAFO closes and the lagoon is emptied. Increased exposure to air may allow ammonia previously leaked into the soil under the lagoon to be converted into nitrate. Because nitrate is highly mobile in soil, it may reach groundwater more readily than ammonia. Ignoring the contaminated soil beneath a closed lagoon could therefore allow substantial quantities of nitrate to reach groundwater.

One study (Volland, Zupancic, and Chappelle 2003) estimated that the cost to remediate the contaminated soil under dairy and hog CAFOs in

continued on page 51

continued from page 42

Kansas alone could amount to $56 million—and Kansas is not a national leader in either dairy or hog production. States that have a larger number of such CAFOs (e.g., California, Iowa, Minnesota, North Carolina, Wisconsin) may face much more extensive lagoon or pit leakage problems than Kansas, depending on geology and other factors. It has been noted that the North Carolina coastal plain features many risk factors for waste runoff and leakage, such as soil percolation potential (Mallin and Cahoon 2003).

The extent of leakage and penetration into groundwater depends on a number of factors that vary considerably between CAFOs, including whether the pit or lagoon is lined, the type of lining, the type of subsoil, the depth of groundwater and aquifers, and the age of the facility. It is clear, however, that leakage is a common problem. It is also important to consider that once pollution has reached an aquifer, it may remain for years, decades, or longer.

We have used the Kansas data to calculate a rough estimate of the total cost of soil remediation under U.S. dairy and swine CAFOs. By dividing the total number of swine and dairy CAFOs by the number of such CAFOs in Kansas (NASS 2002a), then multiplying that figure by $56 million, we arrived at a national cost of $4.1 billion.[20] We did not extend these calculations to poultry and beef CAFOs because their manure storage methods are often considerably different than hog and dairy CAFOs. However, poultry and beef CAFOs also may contribute to manure leaching into groundwater under their manure collection structures.

Compared with nitrate, phosphorus is usually much less soluble in agricultural soils. It has therefore been thought that the primary means by which manure phosphorus enters water is through the runoff of phosphorus bound to soil particles, which in turn has led to a focus on conservation practices intended to limit runoff and soil erosion. Accumulation of phosphorus in soil over a number of years can also lead to increased dissolved phosphorus (Toth et al. 2006; Boesch 2001). Recent data suggest that over several years, phosphorus application at rates above that which can be utilized by crops results in leaching of *dissolved* phosphorus into groundwater in saturated and organic soils (Koopmans et al. 2007; van Es et al. 2004). Measurements of crop field drainage tiles showed substantial dissolved phosphorus from some soils after manure application (van Es et al. 2004).

Groundwater pollution can also result in surface water pollution, because groundwater may enter surface water such as streams or rivers.

Surface water pollution

Manure may spill from holding structures into nearby waterways due to severe weather or poor design or construction. Particularly dramatic instances of surface water contamination have occurred, drawing attention to the vulnerability of these structures and the impact they can have on watersheds. In 1995, for example, 25 million gallons of raw swine waste was released from a single failed lagoon into North Carolina's New River and its estuary, polluting approximately 22 miles of river. This spill caused fish kills, algal blooms, and fecal bacteria contamination, as did a poultry lagoon failure the same year (Burkholder et al. 1997; Mallin et al. 1997). Massive contamination also occurred when Hurricanes Fran, Bonnie, and Floyd hit the North Carolina coast in the 1990s (Mallin and Corbett 2006). Several large spills have also been recorded in other states (Mallin 2000), along with numerous smaller spills.

Although catastrophic failures of manure lagoons have garnered the most public attention, the most common source of water pollution from CAFOs may be the intentional application of manure onto farmland. Nutrients and other pollutants

20 As noted in Chapter 2, NASS data do not have categories corresponding exactly to the EPA definitions of hog and dairy CAFOs, so we used the closest categories available: 500 or more diary cows and 2,000 or more hogs. The number of Kansas hog CAFOs was obtained by multiplying the number of hog farms larger than 1,000 animals in the state by a factor equal to the number of U.S. hog farms larger than 2,000 animals divided by the number of U.S. hog farms larger than 1,000 animals. This estimate may differ from that used in Volland, Zupancic, and Chappelle 2003.

Wanted: Sound Agricultural Policy

Systems that are propped up by billions of dollars in public subsidies are not inevitable. The CAFO system has been nurtured by government policies that favor intensive, industrial-style production—often at the public's expense. These policies include heavily subsidized feed grain, lack of accountability for water and air pollution, counterproductive technological fixes such as the non-therapeutic use of antibiotics in livestock, and an ill-equipped regulatory system that looks the other way rather than confronting the growing economic power of large processors.

Because the success of CAFOs has depended on favorable policies rather than any inherent advantages in production methods, better policies could reverse the damaging ways agriculture is currently practiced in this country. Such policies would eliminate the artificial advantages currently granted to CAFOs, force CAFOs to take financial responsibility for the environmental harm they cause, and support research that would further improve alternative animal farming methods that have already proven safer and better for rural communities than CAFOs. Needed actions include:

- Strict and vigorous enforcement of antitrust and anti-competitive practice laws under the Packers and Stockyards Act (which cover captive supply, transparency of contracts, and access to open markets)
- Strong enforcement of the Clean Water Act as it pertains to CAFOs, including improved oversight at the state level or the takeover of responsibilities currently delegated to the states for approving and monitoring NPDES permits; improvements could include more inspectors and inspections, better monitoring and enforcement of manure-handling practices, and measurement of the effectiveness of pollution prevention practices
- Development of new regulations under the Clean Air Act that would reduce emissions of ammonia and other air pollutants from CAFOs, and ensure that CAFO operators cannot avoid such regulations by encouraging ammonia volatilization
- Continued monitoring and reporting of ammonia and hydrogen sulfide emissions as required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly referred to as the "Superfund") and the Emergency Planning and Community Right-to-Know Act (EPCRA)
- Replacement of farm bill commodity crop subsidies with subsidies that strengthen conservation programs and support prices when supplies are high (rather than allowing prices to fall below the cost of production)
- Reduction of the current $450,000 EQIP project cap to levels appropriate to smaller farms, with a focus on support for sound animal farming practices
- Revision of slaughterhouse regulations to facilitate larger numbers of smaller processors, including the elimination of requirements not appropriate for smaller facilities, combined with public health measures such as providing adequate numbers of federal inspectors or empowering and training state inspectors
- Substantial funding for research to improve alternative animal production methods (especially pasture-based) that are beneficial to the environment, public health, and rural communities

We believe that if CAFOs were required to take financial responsibility for the harm they cause, and entry into markets for alternatives was not held back by a heavily concentrated processing industry and public policies, efficient and safer alternatives would flourish.